

REMARKS

Applicant hereby replies to the Office Action dated August 19, 2009. Applicant thanks the Examiner for carefully considering the application. Applicant notes that the amendments to the specification are fully supported by the original specification. For example, the amendments to par. [0067] are supported by Table 1, which provides basis for the amendments.

Status of Claims

Claims 1, 3-27 and 29-33 are pending in the above-referenced patent application. Claims 1, 31, and 32 are independent.

Claims 6-30 and 33 are rejected under 37 CFR §1.75(c) as being in improper form. Claims 1-5 and 31-32 are objected to for informalities. Claims 1-3 and 31-32 were rejected under 35 U.S.C. §102(b) as being anticipated by EP 0680810 A1 ("EP 810"). Claims 4-5 were rejected under 35 U.S.C. §103(a) as being unpatentable over EP 810 in view of U.S. Patent No. 5,679,407 issued to Mansikkamaki et al. ("US 407") or U.S. Patent No. 4,466,998 issued to McIntyre et al. ("US 998")

Claim Amendments

Claims 1, 3-27 and 29-33 are amended for clarification. Claims 2 and 28 are canceled without prejudice. No new matter is added.

Claim Objections

Claims 6-30 and 33

Claims 6-30 and 33 were rejected under 37 CFR §1.75(c) as being in improper form. Applicant has amended claims 6-27, 29-30 and 33 (claim 28 being canceled) to place the claims in proper form.

Accordingly, withdrawal of the 37 CFR §1.75(c) objection is respectfully requested.

Claims 1-5 and 31-32

Claims 1-5 and 31-32 were rejected for informalities. Applicant has amended claims 1 and 31-32 as suggested in the Office Action to overcome the informal objections.

Accordingly, withdrawal of the informal objections are respectfully requested.

Rejection under 35 U.S.C. 102(e)

Rejection of claims 1-3 and 31-32 is respectfully traversed because, for at least the following reasons, EP 810 does not disclose all of the claimed limitations.

According to MPEP §2131,

‘[a] claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference.’ (Verdegaal Bros. v. Union Oil Co. of California, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987)). ‘The

identical invention must be shown in as complete detail as is contained in the ... claim.’ (Richardson v. Suzuki Motor Co., 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989)). The elements must be arranged as required by the claim, but this is not an ipsissimis verbis test, *i.e.*, identity of terminology is not required. (In re Bond, 910 F.2d 831, 15 USPQ2d 1566 (Fed. Cir. 1990)).

Claim 1 requires, in part,

a. preheating a working solution to a temperature above the atmospheric boiling point of the working solution to form a working solution at a super hot temperature, wherein sufficient pressure is applied throughout the preheating step to ensure the working solution is maintained in a liquid phase; b. contacting a wood or wood based material with the working solution at said super hot temperature and at an elevated pressure such that the working solution is in the liquid phase, to cause impregnation of the liquid phase solution into the wood or wood based material; and c. separating the wood or wood based material and any remaining working solution, waste material and/or by-products; wherein the working solution comprises acetic anhydride (emphasis added).

Claim 31 requires, in part,

a. preheating a working solution to a temperature above the atmospheric boiling point of the working solution to form a working solution at a super hot temperature, at an elevated pressure sufficient to maintain the working solution in the liquid phase; b. applying a pre-pressure to a wood or wood based material prior to contact with the working solution at the super hot temperature, sufficient to maintain the working solution in the liquid phase; c. contacting a wood or wood based material with the working solution at a said super hot temperature and a said elevated pressure to cause impregnation of the solution into the wood or wood based material; d. applying further pressure (the ‘working pressure’) to assist the impregnation of the working solution into the wood or wood based material; e. separating the wood or wood based material and any remaining working solution, waste material and/or by-products; and f.

reducing the pressure to remove any further working solution, waste material and/or by-products; wherein the working solution comprises acetic anhydride (emphasis added).

Claim 32 requires, in part,

a. preheating a working solution to a temperature above the atmospheric boiling point of the working solution to form a working solution at a super hot temperature, at an elevated pressure sufficient to maintain the working solution in the liquid phase; b. contacting a wood or wood based material with the working solution at said super hot temperature and a said elevated pressure to cause impregnation of the solution into the wood or wood based material; c. separating the wood or wood based material and any remaining working solution, waste material and/or by-products; and d. recycling any separated working solution, waste material and/or by-products as the working solution; wherein the working solution comprises acetic anhydride (emphasis added).

In other words, the present invention relates to a process for impregnating wood or wood-based materials using acetic anhydride. As disclosed on pages 1 to 3 of the original specification, the acetylation of solid wood has been extensively investigated, but due to the lack of an appropriate processing system to impregnate wood, its commercial application has been limited. Acetylation, however, is environmentally friendly and prevents water molecules from penetrating the cell wall of wood by substituting the hygroscopic hydroxyl group of lignin and hemicellulose with hydrophobic acetyl groups. This is shown schematically on page 8 of the original specification. The larger size of the acetyl group as compared to the hydroxyl group it replaces, causes a swelling of the wood, which improves the properties of the wood, for example by reducing its moisture uptake.

EP 810 discloses the acetylation of wood using cold or warm acetic anhydride. Either pressure or a vacuum is applied during the impregnating step. The wood is surrounded by heated liquid acetic anhydride during the acetylation reaction and afterwards excess acetic anhydride is drained off. Thereafter, a vacuum is applied to extract non-reacted acetic anhydride and by-product acetic acid from the wood. Finally, a steam or water treatment is performed so that an acetylated wood product is obtained that is substantially free of non-reacted acetic anhydride and acetic acid.

According to the disclosure and invention of EP 810, the latter two steps for extracting non-reacted acetic anhydride and the by-product acetic acid are important, since non-removed acetic acid in acetylated wood is a major obstacle for the industrial use of acetylated wood because of its severe smell. Example 2 on page 4 of EP 810 illustrates the effect of steam treatment on acetylated wood, such that after 105 minutes of steaming only 0.6% residual acetic acid remains in the wood (from an initial content of 7%).

Page 6, lines 20 to 29 of Applicant's original disclosure describes in detail the claimed feature of the working solution being contacted with the wood under elevated pressure to keep the super hot working solution in its liquid phase and to prevent it from boiling off. Applicant's specification recites that the high temperature and the oxidation free environment may induce some additional benefits on both stability and biodeterioration resistance of the wood due to the thermal treatment.

The present application does not use a cold or warm acetic anhydride solution as taught in EP 810. Instead it uses an acetic anhydride solution which is preheated to a temperature above its atmospheric boiling point to form a working solution at a super hot temperature. During the preheating step, sufficient pressure is applied to ensure the working solution is maintained in the liquid phase. The impregnation step is also carried out at an elevated pressure such that the working solution is kept in the liquid phase, thereby causing impregnation of the liquid phase solution into the wood.

Further, referring to the Figure of EP 810, the preliminary pressure is applied to the cold or warm timber. Then, acetic anhydride is added to the timber. EP 810 does not teach or suggest of the acetic anhydride being warmed under applied pressure. Therefore, it is clear that EP 810 does not teach or disclose the limitations of

a. preheating a working solution to a temperature above the atmospheric boiling point of the working solution to form a working solution at a super hot temperature, wherein sufficient pressure is applied throughout the preheating step to ensure the working solution is maintained in a liquid phase; b. contacting a wood or wood based material with the working solution at said super hot temperature and at an elevated pressure such that the working solution is in the liquid phase, to cause impregnation of the liquid phase solution into the wood or wood based material (emphasis added)

as required, in part, by amended claim 1,

a. preheating a working solution to a temperature above the atmospheric boiling point of the working solution to form a working solution at a super hot temperature, at an elevated pressure sufficient to maintain the working solution in the liquid phase; b. applying a pre-pressure to a wood or wood based material prior to contact with

the working solution at the super hot temperature, sufficient to maintain the working solution in the liquid phase; c. contacting a wood or wood based material with the working solution at a said super hot temperature and a said elevated pressure to cause impregnation of the solution into the wood or wood based material; d. applying further pressure (the `working pressure`) to assist the impregnation of the working solution into the wood or wood based material (emphasis added)

as required, in part, by amended claim 31, or

a. preheating a working solution to a temperature above the atmospheric boiling point of the working solution to form a working solution at a super hot temperature, at an elevated pressure sufficient to maintain the working solution in the liquid phase; b. contacting a wood or wood based material with the working solution at said super hot temperature and a said elevated pressure to cause impregnation of the solution into the wood or wood based material (emphasis added)

as required, in part, by amended claim 32.

In view of the above, EP 810 fails to disclose all of the claimed limitations of independent claims 1, 31 and 32 of the present application. Thus, independent claims 1, 31, and 32 of the present application are patentable over EP 810 for at least the reasons set forth above. Additionally, the claims that directly or indirectly depend on claim 1, namely claim 3 (claim 2 being canceled), is also patentable over EP 810 for at least the same reason.

Accordingly, withdrawal of the 35 U.S.C. §102(b) rejections are respectfully requested.

Rejections under 35 U.S.C. §103(a)

The rejection of claims 4-5 under 35 U.S.C. § 103(a) as being unpatentable over EP 810 in view of US 407 or US 998 is respectfully traversed because for at least the following reasons: EP 810 and US 407 or US 998 either separately or combined, does not disclose all of the claimed limitations.

According to MPEP §2142

[t]he key to supporting any rejection under 35 U.S.C. 103 is the clear articulation of the reason(s) why the claimed invention would have been obvious. The Supreme Court in *KSR International Co. v. Teleflex Inc.*, 550 U.S. ___, ___, 82 USPQ2d 1385, 1396 (2007) noted that the analysis supporting a rejection under 35 U.S.C. 103 should be made explicit. The Federal Circuit has stated that ‘rejections on obviousness cannot be sustained with mere conclusory statements; instead there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.’ *In re Kahn*, 441 F.3d 977, 988, 78 USPQ2d 1329, 1336 (Fed. Cir. 2006). See also *KSR*, 550 U.S. at ___, 82 USPQ2d at 1396 (quoting Federal Circuit statement with approval).

Further, according to MPEP §2143, “[T]he Supreme Court in *KSR International Co. v. Teleflex, Inc.* 550 U.S. ___, ___, 82 USPQ2d 1395-1397 (2007) identified a number of rationales to support a conclusion of obviousness which are consistent with the proper “functional approach” to the determination of obviousness as laid down in *Graham*.” And, according to MPEP §2143.01, [o]bviousness can be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so. *In re Kahn*, 441 F.3d 977, 988, 78 USPQ2d 1329, 1335 (Fed. Cir. 2006). Further, “[t]he

mere fact that references can be combined or modified does not render the resultant combination obvious unless the results would have been predictable to one of ordinary skill in the art.” *KSR International Co. v. Teleflex, Inc.* 550 U.S. ___, ___, 82 USPQ2d 1385, 1396 (2007).

Additionally, according to MPEP §2143

[a] statement that modification of the prior art to meet the claimed invention would have been “well within the ordinary skill of the art at the time the claimed invention was made” because the references relied upon teach that all aspects of the claimed invention were individually known in the art is not sufficient to establish *prima facie* case of obviousness without some objective reason to combine the teachings of the references. *Ex parte Levengood*, 28 USPQ2d 1300 (Pat. App. & Inter. 1993).

Claims 4-5 indirectly depend on amended claim 1. As asserted above, EP 810 does not teach or suggest the limitations of

a. *preheating a working solution to a temperature above the atmospheric boiling point of the working solution to form a working solution at a super hot temperature, wherein sufficient pressure is applied throughout the preheating step to ensure the working solution is maintained in a liquid phase*; b. *contacting a wood or wood based material with the working solution at said super hot temperature and at an elevated pressure such that the working solution is in the liquid phase, to cause impregnation of the liquid phase solution into the wood or wood based material*; and c. *separating the wood or wood based material and any remaining working solution, waste material and/or by-products; wherein the working solution comprises acetic anhydride (emphasis added),*

as required, in part, by amended claim 1.

US 407 relates to impregnating wood with polymerizable within the wood using heat. The method of US 407 discloses polymerizing the polymerizable while the wood is in contact with water. The water is an excellent medium when heating the impregnated wood material to the polymerization temperature and when cooling an exothermal polymerization reaction. It would be clear to an ordinary person skilled in the art that the polymerization process of US 407 is very distinguishable from the acetylation process of Applicant's claimed invention.

US 998 relates to the impregnation of wood using water-borne preservative salts. The aim of US 998 is to prevent precipitation of water-borne salts such as chromium, copper and arsenic when wood sugars enter the treating solution during a pressure release phase of the empty-cell method used. US 998 achieves this by maintaining the temperature of the treating solution at no more than about 70 degrees F (21 degrees C). It would be clear to an ordinary person skilled in the art, however, that US 998 does not relate to the acetylation of wood nor to the use of super hot temperatures as with Applicant's claimed invention.

It is clear that US 407 and US 998 disclose processes for improving the properties of wood by forcing substances into the empty cells of the wood fibre, but do not disclose methods for wood acetylation, which involves a chemical reaction in the cell walls. Therefore, even if EP 810 is combined with US 407 or US 998, the result would still not teach or suggest "a. *preheating a working solution to a temperature above the atmospheric boiling point of the working solution to form a working solution at a super hot temperature, wherein sufficient*

pressure is applied throughout the preheating step to ensure the working solution is maintained in a liquid phase; b. contacting a wood or wood based material with the working solution at said super hot temperature and at an elevated pressure such that the working solution is in the liquid phase, to cause impregnation of the liquid phase solution into the wood or wood based material” (emphasis added) as required, in part, by amended claim 1.

Further, the assertions made in the Office Action on page 4 that lead to a conclusion of obviousness are not explicit and the basic requirements of an articulated rationale under MPEP §2142 cannot be found. Additionally, since the combination of EP 810 and US 407 or US 998 does not teach, disclose or suggest all the limitations of Applicant's amended claim 1, as listed above, Applicant's claim 1 is not obvious over EP 810 in view of US 407 or US 998 since a *prima facie* case of obviousness has not been met under MPEP §2143. Thus, claim 1 of the present application is patentable over EP 810 in view of US 407 or US 998 for at least the reasons set forth above. Additionally, the claims that indirectly depend on amended claim 1, namely claims 4-5, are allowable for at least the same reasons.

Accordingly, withdrawal of the 35 U.S.C. § 103(a) rejections of claims 4-5 are respectfully requested.

Additional Prior Art Made of Record

The Office Action asserts that US Patent 6,376,582 (“US 582”) discloses the acetylation of wood fibers by contacting the fibers with the gaseous vapour of an acetylating agent in the vapour phase. Hence, the reaction temperature is around 140 to 210 degrees C and the reaction pressure is atmospheric pressure. Distinguishable, Applicant’s claimed invention recites that gaseous acetylation of wood at high temperature has only been successful on very small wood particles such as fibres and refers to US 582 in this regard in Applicant’s background section. It is clear that US 582 does not teach or suggest “a. *preheating a working solution to a temperature above the atmospheric boiling point of the working solution to form a working solution at a super hot temperature, wherein sufficient pressure is applied throughout the preheating step to ensure the working solution is maintained in a liquid phase*; b. contacting a wood or wood based material with the working solution *at said super hot temperature and at an elevated pressure such that the working solution is in the liquid phase*, to cause impregnation of the liquid phase solution into the wood or wood based material” (emphasis added) as required, in part, by amended claim 1, and similarly in amended claims 31 and 32. Therefore, Applicant’s amended claims 1 and 31-32 are patentable over US 582 for at least these reasons.

CONCLUSION

In view of the foregoing amendments and remarks, Applicant believes that the claims are in condition for allowance. Reconsideration, re-examination, and allowance of all claims are respectfully requested. If the Examiner feels that a telephone interview may help further the examination of the present application, the Examiner is encouraged to call the undersigned attorney or his associates at the telephone number listed below.

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Respectfully submitted,

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